MARCH 4, 1950
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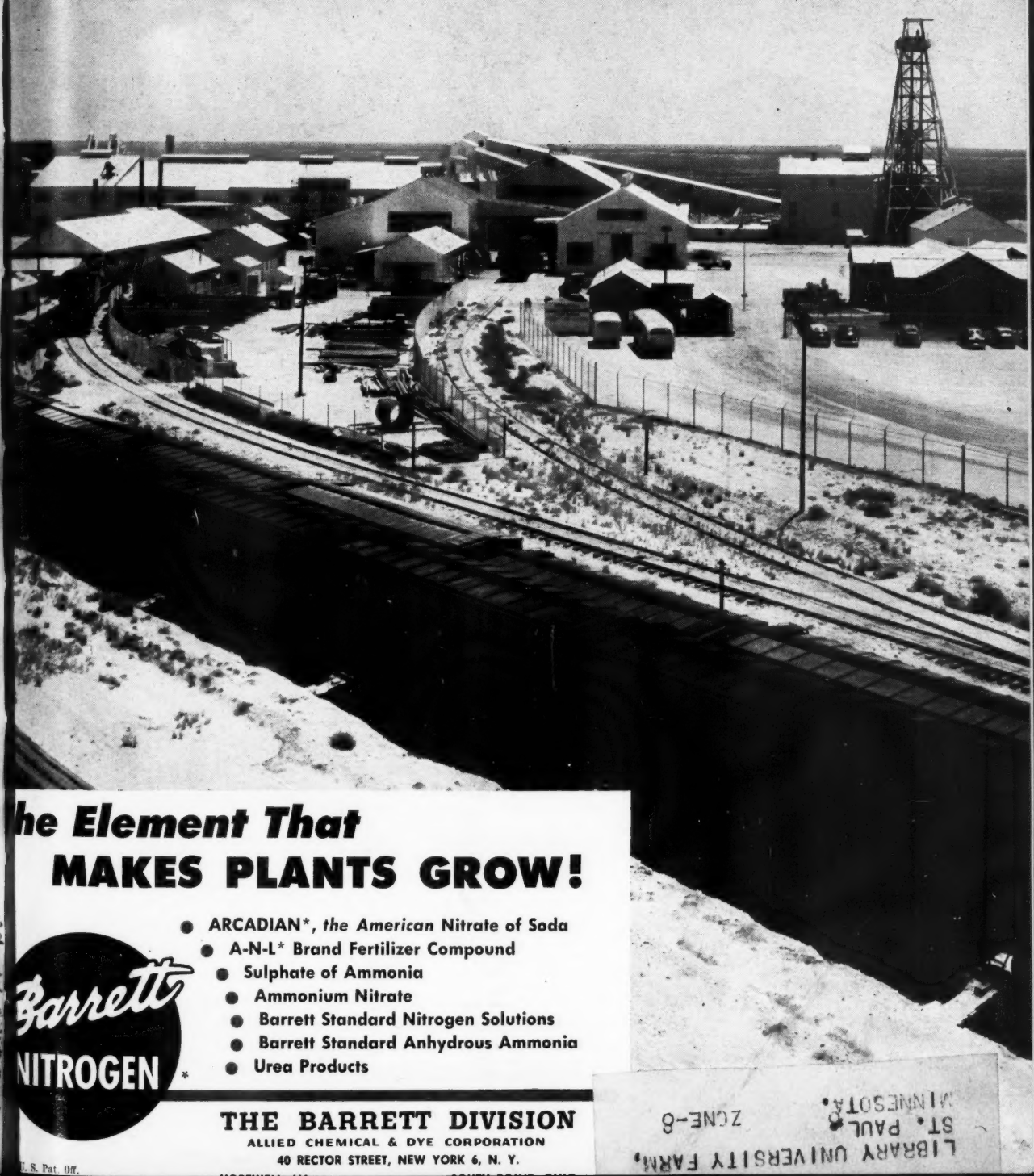
AMERICAN FERTILIZER



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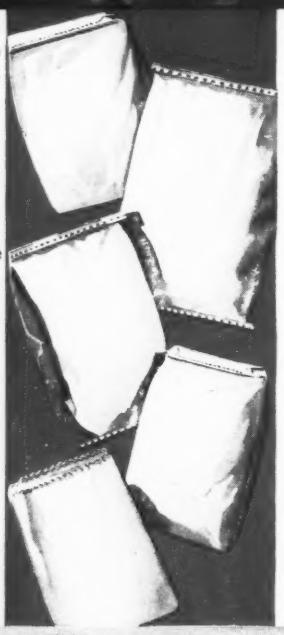

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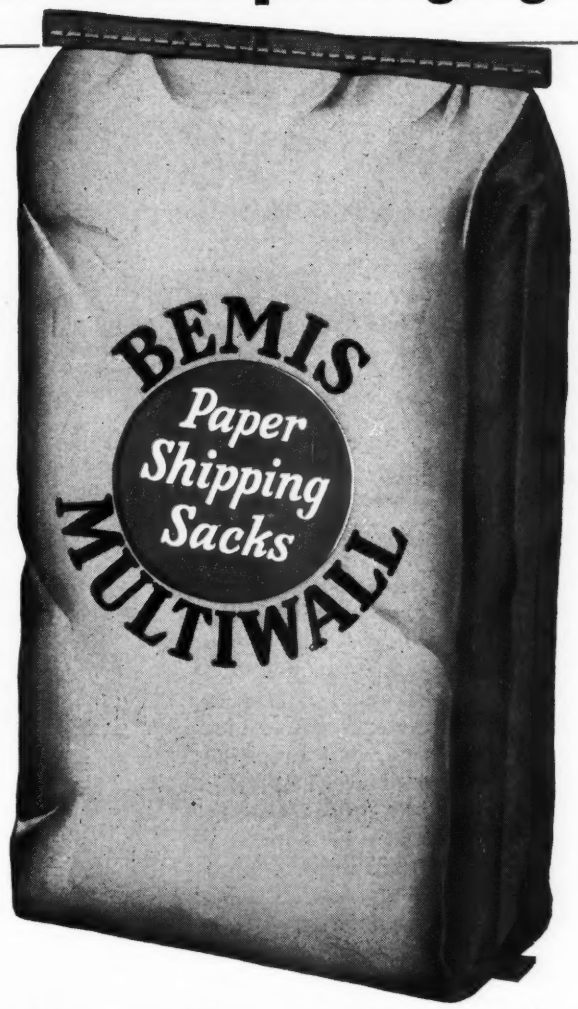

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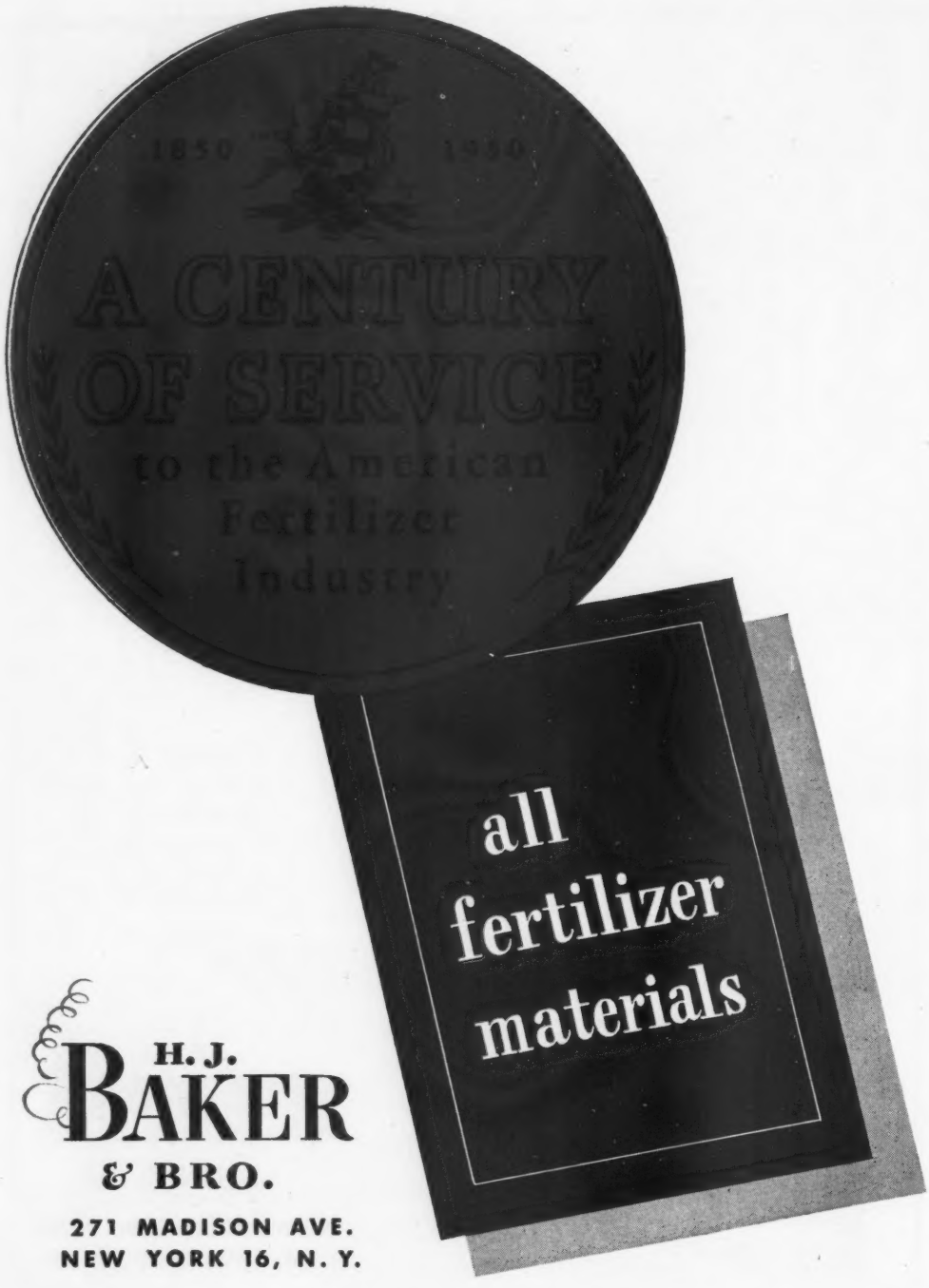

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The American FERTILIZER

Vol. 112 MARCH 4, 1950 No. 5

Mineral Elements and Nitrogen in Manure versus Manure

By Jackson B. Hester*

Department of Agricultural Research, Campbell Soup Co., Riverton, N. J.

THROUGHOUT the ages organic animal manure has been considered by many people to be the most satisfactory for practical purposes and the only substantial source of plant nutrients. There is today a group of "die-hards" which are still maintaining that the only method of maintaining soil fertility and good health of human beings is through the use of manure and other natural sources of organic matter as a source of plant nutrients in crop production. It has been shown by scientific data (*1, 2, 3, 4, 5*)** that plants grown on mineral elements and fixed nitrogen alone have the characteristics of plants grown with the most satisfactorily developed compost. Because of the fact that there is some question regarding the use of minerals and nitrogen in crop production as compared to the use of manure and other organic sources of plant nutrients, an investigation has been undertaken to ascertain information along this line.

A source of dry animal manure was obtained and a rather complete analysis made for the mineral and nitrogen constituents of this material. The analysis revealed (with some slight variation) that 4,000 pounds of dry manure contained 46 pounds of calcium, 12 pounds of magnesium, 74 of nitrogen, 6 of sulphur, 17 of phosphorus, 82 of potassium, 15 of iron, 6 of manganese, 0.14 of boron, 0.7 pounds of copper and, of course, traces of molybdenum and other elements essential for plant growth. It was ascertained that the average manure was 80 per cent water and 20 per cent dry matter. Therefore, the usual ten-ton application of manure represented 4,000 pounds of dry matter.

Greenhouse Tests

The first investigation in connection with mineral elements and nitrogen as soluble salts versus manure was carried out under carefully controlled greenhouse conditions using 10-gallon pots that held 150 pounds of soil. The elements found in manure were compounded by using various souces of inorganic salts such as to closely approximate the composition of manure in all elements. A Sassafras sandy loam was used in the investigation with average applications of fertilizer.

The experiment consisted of three treatments, each of which received the same amount of lime and fertilizer, namely lime to bring the soil p*H* value to approximately 6.2 and 5–10–10 fertilizer at the rate of 1000 pounds per acre. Using dry manure equivalent to 10 tons of wet manure per acre and the mineral elements and nitrogen equivalent to those found in the 10 tons of manure, seven crops were grown in the following order: tomatoes, alfalfa, tomatoes, Alaska peas, lima beans, carrots and tomatoes. The yields obtained from these crops are shown in Table 1. In all instances, except with alfalfa and lima beans, an increase in yield was obtained from the use of manure and the mineral elements and nitrogen in manure. The second application of fertilizer and manure was made just after the growth of alfalfa. The lack of increase in yield from the manure and mineral elements was associated with those crops being capable of fixing their own nitrogen, namely alfalfa and lima beans. The data reveal that the mineral elements and fixed nitrogen in soluble form equivalent to the elements in manure produced superior yield in all cases other than the two afore-mentioned crops.

A careful analysis of the tomatoes and tomato vines was made and these data are shown in Table 2. A number of soil conditions influence the chemical composition of the plant. For instance, if one factor

*A paper presented before the American Chemical Society, September, 1949.

**Numbers in parenthesis refer to literature listed at the end of the paper.

such as nitrogen is limiting, the plants tend to accumulate elements such as calcium, magnesium, phosphorus, potassium and other elements. Therefore, a mere analysis of a plant does not reveal actually what has happened, but it is obvious from the date on the per gram basis that the mineral elements and nitrogen are supplying these elements equal or superior to the manure. It is further revealed by these data that quality factors such as ascorbic acid, sugars, titrable acids, color, etc., of the tomatoes grown on the pots containing the mineral elements and nitrogen are equal to or superior to those grown without treatment.

Field Tests

Since mineral elements and nitrogen produced equally as good yields and quality as manure under controlled conditions, it was decided to investigate the same problem under field conditions. For this purpose a fertility-depleted Evesboro sand was used. The plats were so located that each treatment could be repeated for two consecutive years in

(*Continued on page 32*)

The test plot showing (left photo) earlier and (right photo) later stages of growth. In each picture, the rows to the left received 1000 lbs. per acre of 5-10-10; the rows to the left received 1000 lbs. per acre of 5-10-10 plus mineral elements equivalent to 10 tons of manure

TABLE 1
YIELD OF VARIOUS CROPS WITH MANURE AND SOLUBLE SALTS EQUIVALENT TO MANURE

GRAMS PER 150 LBS. SOIL PER POT

	Tomatoes	*Alfalfa*	*Tomatoes*	*Peas*	*Alaska Lima Beans*	*Carrots*	*Tomatoes*
Treatment (1)	*G. Wt. Fruit*	*Dry Weight*	*G. Wt. Fruit*	*G. Wt. Peas*	*G. Wt. Beans*	*G. Wt. Roots*	*G. Wt. Fruit*
No Manure	2424	130	247	27	178	650	839
Manure (2)	2635	93	793	43	90	650	1176
Mineral Elements and Nitrogen (3)	2815	129	911	53	165	665	1142

Original application made 8/24/45. Second application made 8/16/46.
(1) All pots received 100 lbs., 5–10–10 acre.
(2) 4000 lbs. dry cattle manure per acre or 10 tons wet.
(3) Minerals and nitrogen from soluble salts equivalent to manure.

TABLE 2
COMPOSITION OF TOMATO VINES AND FRUITS

	m. e. per gram—dry weight					*ppm—Dry Weight*		*ppm*	*m.e.–L.*		
Treatment	*Ca*	*Mg*	*K*	*P*	*N*	*Mn*	*Fe*	*Ascorbic Acid*	*G.–L. Sugar*	*Titrable Acids*	*Color*
	Vines								*Fruit*		
No Manure	2.70	0.75	1.43	1.26	2.33	82	645	172	15.2	59	A—
Manure	2.31	0.72	1.46	0.15	1.21	102	625	173	26.0	52	B
Mineral Elements and Nitrogen	2.30	0.77	1.64	0.18	3.57	90	525	185	23.4	71	A

NFA'S NEW MOVIE TO BE READY SOON

Are you clever at thinking up movie titles?

If so, then you can certainly help the National Fertilizer Association with their new movie.

The Association has started a new film which, as planned now, will dramatically show the vast changes that have taken place in agricultural practices during recent decades, especially as these changes relate to fertilizer usage.

A rough draft of the script has been submitted to members of the Plant Food Research Committee, which is sponsoring the picture, and many constructive suggestions and comments have already been received.

Some of the titles, already suggested, are: "Changing Times," "Acres Are Larger," "More Profitable Acres," "Every Acre Works Harder" and "Yesterday, Today and Tomorrow." We could suggest "Soil, Toil and Progress" or "As Crops Grow, Nations Grow."

SAUNDERS PROMOTED IN PHOSPHATE DIVISION

Dr. James H. Saunders has been promoted to group leader in the research department of the Phosphate Division of Monsanto Chemical Company with headquarters in Anniston, Ala., it was announced recently.

A native of Kentucky, Dr. Saunders received his Bachelor's Degree in Chemistry from the University of Kentucky in 1944. He then attended the University of Illinois where he received his Ph.D. degree in Organic Chemistry in 1946. While at Illinois, he served as a special research assistant on the Government Synthetic Rubber program from 1944 to 1947, and was in charge of the Synthesis Group from 1946 to 1947, when he joined the research department of Monsanto.

As group leader, Dr. Saunders' responsibilities will cover research and development in the field of special organic chemicals of interest to the Phosphate Division.

IMPRESSIONS OF AMERICA

By John Higson Smith

Leader of the United Kingdom Fertilizer Team Which Visited the United States in November-December, 1949

OUR tour in America has been so full of interest and incident that it was a difficult task to formulate our impressions whilst we were still so near to it. In addition, we covered only a small fraction of the country's total area in our tour of over four thousand miles—and therein lies our first impression, the tremendous size of the country and the problems of haulage which it involves.

One impression — conviction would be the better word—is outstanding: The generous hospitality and warm friendliness of the American people towards us. We have met this wherever we have gone—in the factory and business premises, in the home and even in the restaurants and drugstores. These feelings are quite genuine and reflect the consciousness in the American mind that our two peoples are fundamentally alike and want the same things from life. The interest in our country's affairs is universal and we could not tell them too much about what conditions are like in Great Britain today. In many cases we found quite erroneous impressions of the conditions in Britain, probably gained partly from liberal reporting in the Press with some bias and partly from thoughtless exaggeration in conversation with people who had travelled through Britain; these we did our best to correct.

The American seems anxious to improve his status and thinks much less about social security than the British. He takes a chance where his British counterpart would hesitate. This ambition to improve himself is reflected in his determination to own his own car (the number of cars on the roads in America staggered us), his own home, a refrigerator and other luxuries which are exceptional in Britain—even at the expense of mortgaging part of his future. On the other hand, when he sets out to enjoy himself, he really "goes to town" and is not so much restricted by conventions and inhibitions like his British counterpart. The American appears to be more interested in his government and especially its local administration and is more prepared to fight for what he considers his civic rights.

Standards of Living

There is no doubt that, on the average, the standard of living is higher in America than in Britain. Although some essential goods such as foodstuffs and clothing appear to be more expensive in America (and here it must be remembered that essential British foodstuffs are subsidized by the Government and are therefore sold at an artificially low price), many luxury goods, such as automobiles and refrigerators, apparently regarded by most Americans as near-necessities, are very much cheaper. The American, however, pays out a greater percentage of his income than the British in renting or purchasing his home. Whilst we found that the American grumbles about heavy State and Federal taxation, there is no doubt that taxation, both direct and indirect, is very much heavier in Great Britain.

Before we can really formulate our conclusions on the American fertilizer industry, we must have the opportunity to sort out the tremendous number of impressions we have gained and examine critically the information we have received.

The first impression is the very keen sense of competition which exists in the American industry, which must inevitably provide a great urge to produce at a lower unit cost. On the other hand, less attention is devoted to production statistics, and the impression has been gained that perhaps we in Britain devote too much effort to such statistical information.

The trend of technical development in America has been shaped by the ammonium citrate solubility in contrast to the water solubility criterion for available phosphate in Britain. Thus ammoniation of superphophate by ammoniated and nitrogen solutions has developed rapidly here, whereas in Britain this is economically impracticable because of reversion, which reduces the phosphate content soluble in water by a very considerable amount. Similarly, other developments which depend for their success on the application of the ammonium citrate solubility test for available phosphate have occurred in America, but not in Britain. The only major technical development in Britain which is not widely used in America is that of granulation, which in addition to reducing problems of conditioning, gives a product admirably suited for drill application.

Superphosphate Production

On the production of superphosphate, the main difference is that, whereas in Britain the continuous process is extensively used, in America the older type batch processes seem to predominate.

We have been impressed by the emphasis laid on the education in the correct use of fertilizers, the advantages to be gained thereby, and the advisory facilities extended to the farmer, not only by the individual manufacturing companies but by the National Fertilizer Association and the State colleges and Governmental experimental stations. Our Fertilizer Manufacturers' Association might to advantage consider extending their publicity on these lines.

The use of secondary elements in fertilizers which has taken such a prominent place in American fertilizer practice is not regarded with such importance in Great Britain. This may well be due to the maintenance of a higher standard of

(*Continued on page 32*)

THE AMERICAN FERTILIZER

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Front cover illustration shows Potash Refinery of International Minerals & Chemical Corporation at Carlsbad, N. M. Photo by Hedrich-Blessing.

THE NEXT HUNDRED YEARS

As we get well into 1950 it is time to stop and reconsider the fact that the commercial fertilizer industry occupies one of the key positions in the American economic system today.

One of the important groups in the country, from an agricultural viewpoint, are you—our readers. On you, your thinking and future plans, depends the agricultural progress of our land. The fertilizer industry is the keystone in the arch of an agricultural bridge leading to a new and better world in which to live.

To be specific, the members of this industry must look about them at crumbling institutions, ideas, and ideals, and refuse to think that one century of progress in the unchanging past will insure another century of progress in the uncertain future

With the new shift in the emphasis of government aid and control from units of production to acres under cultivation, it is now time for a strong public relations program by all phases of our industry.

This public relations program should point out to farmers, and all others interested in the field, the many possible uses of agricultural products and machinery manufactured by those whose main interest is the numerical growth of users of commercial fertilizer.

Much of the burden of this public relations program rests on the shoulders of the fertilizer salesmen. Their "front line" sales job depends in turn on the "supply line" from headquarters—from the "top brass" so to speak. Every executive of our industry must convince the members of the sales staff that now is the time to increase the use of commercial fertilizer by modern educational and research aids. If this is done these salesmen who are "on-the-spot" and know the "grass-roots" problems will then do a good job of sales promotion on the customers.

This will keep the sales volume up, and so contribute toward keeping the American agricultural picture in focus—no over-enlargement

and yet no underdevelopment—just a sharp, clear picture of this weathervane of agricultural economics—the commercial fertilizer industry.

AMERICAN FERTILIZER is making no definite suggestions on such a public relations program, for we feel that the pages of this magazine are open for your contributions, and as men of long experience in the field you should have many.

PASTURE TREKKERS IN THE DEEP SOUTH

The long caravan of cars slowed, and stopped at a farm in Walthall county, Mississippi, in the heart of the Deep South.

Some 150 pasture trekkers on the winter grazing tour took a final look at the last green pasture on the scheduled trip, and commented once again on the miles of green they had seen in the last 48 hours on one of the most successful of all grazing events.

This tour, conducted by NFA's Plant Food Research Committee and Mississippi State College, was one of the first of many Pasture Year events planned for 1950.

The growing interest in the pastures movement was demonstrated by the large turnout for the February 7–8 tour of pastures on farms near the college, and by the 121 persons who attended the tour dinner held at the Heidelberg Hotel in Jackson, Miss.

Following the grazing event many of the group went to Biloxi for the Southern Agricultural Workers' conference.

MARYLAND MEETING

Many fertilizer manufacturers, salesmen, dealers, and others interested in fertilizers and their use in Maryland, attended the recent conference held at the University at College Park recently.

Minor elements held the discussion spotlight and all who spoke emphasized that applications should be made with care for any excess of these minor elements in the soil might result in toxic conditions.

MATHIESON APPOINTS

Stanley deJ. Osborne has been elected a vice-president and treasurer of Mathieson Chemical Corporation, Baltimore, and L. Kermit Herndon has been appointed director of research, the company announced.

Mr. Osborne, whose headquarters will be in Baltimore, succeeds Dr. D. P. Morgan, who was named a vice-president and director of the development department with headquarters in New York. He was formerly vice-president of Eastern Airlines, Inc., and, before that, in 1942 to 1944, was special assistant to the rubber director in Washington. Before the war, he had been with the Old Colony Corporation, Boston, and the Atlantic Coast Fisheries Company, New York.

Mr. Herndon, who is currently professor of chemical engineering at Ohio State University, will be in charge of research, pilot plant and market development work with headquarters at the company's laboratories in Niagara Falls N. Y. Consulting engineer to the company prior to his present appointment, Dr. Herndon will continue to hold his university post while completing graduate research assignments and supervising Mathieson's Ohio State University research project. He was director of research for the Southern Acid & Sulphur Company, St. Louis, which was acquired by Mathieson last year.

SOIL WORK SPONSORED BY FERTILIZER FIRMS

Dr. Russell Kennedy Stivers, for the past three years assistant professor of agronomy at Purdue University, has been named associate agronomist at V.P.I. to do research work in soil fertility, Dr. H. L. Dunton, head of the agronomy department, announces.

The soil fertility work is being expanded as the result of contributions from leading fertilizer manufacturers in Virginia through the V.P.I. Educational Foundation, Inc. The gifts were announced earlier by Dr. John R. Hutcheson, V.P.I. chancellor, whose entire time now is devoted to the Foundation.

Dr. Stivers will have headquarters at V.P.I., but will conduct work at Blacksburg and at all agronomic field units of the Virginia Experiment Station. Especial attention will be given to fertility research with tobacco, peanuts, corn, small grains, and alfalfa. The part played by trace elements in plant production on different soil types also will be studied.

NEW AMMONIATING PLANT IN CALIFORNIA

California continues to lead the parade of progress with new plant news in the fertilizer field.

This time the news is that Sunland Industries of Fresno has just completed an addition and a modernizing job on its plant at a cost of over $300,000. The addition is the first plant of its kind on the west coast for "ammoniating" superphosphate. The latest machinery with photo-electric control was installed and will turn out ten tons an hour of the new type fertilizer.

R. E. JURY

New Western Sales Manager of Arkell & Smiths, bag manufacturers, who will supervise the Kansas City, Minneapolis and Chicago territories

January Tax Tag Sales Show Decrease

COMBINED figures covering fertilizer tax tag sales and reports of fertilizer shipments by manufacturers in 13 Southern and Midwestern States during January, totaled 983,449 equivalent short tons, according to a compilation prepared by The National Fertilizer Association.

The January figure represents a decline of approximately 300,000 tons, or 24 per cent, from the corresponding total recorded for the same month last year, and reflects a drop of 28 per cent in the South and of 8 per cent in the Midwest. Among the individual States whose figures provide the basis for the compilation, the largest decline — from 307,000 tons in January 1949 to 86,000 tons in January 1950 — took place in North Carolina. A substantial part of the decrease in this figure, however, may be a reflection of the change in North Carolina's fertilizer control program which went into effect late in 1949. Under the old law some manufacturers bought enough tags during January to take care not only of January sales but also of anticipated later business; this practice would tend to inflate the January figure at the expense of figures for later months. Figures obtained under the new program, requiring as it does monthly reports of actual fertilizer shipments, would tend to reflect January sales only and would therefore be comparatively smaller than those based solely on tax tag sales.

Substantial declines in equivalent tonnage were also reported by Alabama, Tennessee, Arkansas, Louisiana and Kentucky, but four of the States — Georgia, Florida, Indiana and Missouri — reported greater tonnages this January than last.

During the first seven months of the current fiscal year, a total of 3,594,000 equivalent short tons have been recorded. This figure is approximately 18 per cent below the comparable 1948–49 total which amounted to 4,391,000 tons. The Southern States' total is down 19 per cent, while that of the Midwest dropped 16 per cent. Only one of the States — Florida — reported an increase in January-July 1950 tonnage over that of the same period a year earlier.

Better tonnages are expected for February, March and April, but whether they can reach the 1949 totals will depend on potash deliveries which will permit increased output.

FERTILIZER TAX TAG SALES[1] AND SHIPMENT TONNAGES[2]

(In Equivalent Short Tons)

COMPILED BY THE NATIONAL FERTILIZER ASSOCIATION

State	January		Fiscal Year Cumulative July-January	
	1950	1949	1949–50	1948–49
Virginia (t)	83,260	90,767	271,688	281,673
N. Carolina[3]	86,070	307,328	276,822	771,266
S. Carolina (t)	157,950	173,454	358,094	409,394
Georgia (t)	149,329	131,695	366,542	391,658
Florida (t)	138,723	115,793	607,352	463,967
Alabama (t)	41,839	88,085	207,356	274,449
Tennessee (t)	16,084	26,229	117,127	167,801
Arkansas (t)	16,915	28,776	84,333	117,184
Louisiana (r)	19,631	27,638	76,075	97,059
Texas (r)	40,354	49,968	256,003	259,274
Total South	750,155	1,039,733	2,621,392	2,233,725
Indiana (t)	98,375	96,532	503,794	603,607
Kentucky (t)	57,415	88,355	223,462	299,684
Missouri (t)	77,504	67,881	245,488	253,637
Total Midwest	233,294	252,768	972,744	1,156,928
Grand Total	983,449	1,292,501	3,594,136	4,390,653

[1] The letter (t) denotes States whose data are based on sales of fertilizer tax tags. The figures are the number of short tons of fertilizer represented by the tags sold to fertilizer producers who are required by law to attach one to each bag of fertilizer they sell in these States. The tonnage so represented may be somewhat larger or smaller than actual amounts of fertilizer sold because of the lag between the purchase of tags and the delivery of fertilizer on which those tags are used.

[2] Current tonnage figures for States whose names are followed by (r) are the shipments of fertilizer for use in these States as reported by manufacturers to the appropriated State agencies.

[3] North Carolina law permits each manufacturer either to use tax tags or to submit monthly reports on the amounts of fertilizer shipped in the State. Current figures are the total (unduplicated) number of short tons of fertilizer represented by both tax tag sales and manufacturers' reports.

BONE MEAL TANKAGE BLOOD

SHEEP—COW—POULTRY MANURE

CASTOR POMACE NITROGENOUS

GROUND TOBACCO STEMS HOOF MEAL

ALL FERTILIZER MATERIALS

FRANK R. JACKLE

405 Lexington Avenue New York 17, N. Y.

FERTILIZER MATERIALS MARKET

NEW YORK

No Shortage of Sulphate of Ammonia in Spite of Coal Strike. Fertilizer Organics in Good Demand with Improvement in Feed Material Sales. Superphosphate Shipments Improving. Potash Will be Tight for Balance of Season.

NEW YORK, March 1, 1950

Sulphate of Ammonia

If the coal strike continues long enough, it is thought it would have some effect on the by-product material but so far there is no shortage and, as a matter of fact, a surplus exists at some points.

Nitrate of Soda

Demand has slowed up for this material, although shipments in some sections are holding up. Importers are keeping adequate stocks at most ports.

Nitrogenous Tankage

Most producers are sold ahead for some time and the demand continues excellent. Several lots from abroad recently arrived at Atlantic ports.

Castor Pomace

While no material has been offered recently, demand continues good, with last sales made at $30.50 per ton, f.o.b. production points. Buyers are trying hard to obtain material for quick shipment to complete their mixing operations.

Organics

Tankage and blood were in better demand from the feed trade and sales were made at $7.50 per unit of ammonia ($9.12 per unit N), f.o.b. Eastern shipping points. Fertilizer buyers bought in a limited way. The Chicago market was slightly stronger in sympathy with the Eastern market. Soybean meal in bulk was quoted at $54.00 per ton, f.o.b. Decatur, Ill., and linseed meal was firmer at $65.00 per ton in bulk, f.o.b. production points. Cottonseed meal held at $61.00 per ton, f.o.b. Southeastern points, with demand fairly good.

Fish Meal

It was stated some domestic fishing companies were trying to sell fish meal for summer shipment on a "when and if made" basis at around $160.00 per ton, f.o.b. fish factories, without much success. Demand was poor at the present time from the feed trade and increased offerings of imported material did not help the market any

Bone Meal

Demand for fertilizer bone meal, both steamed and raw, continues good and some producers are sold ahead. Some foreign feeding bone meal has been arriving at various Atlantic and Gulf ports.

Hoof Meal

Demand for this material was rather slow at present with last sales on basis of $7.00 per unit of ammonia ($8.51 per unit N), f.o.b. Chicago.

Superphosphate

While shipments on contract have been a little better recently, they are still considerably behind last year. No price changes have been reported.

Potash

Domestic producers are doing everything possible to fill existing contracts as quickly as possible but buyers will not get the full quantity they bought this season because of the recent strike. Imported material is arriving but not in sufficient quantity to overcome the shortage. A tight situation is looked for in this material for the next 60 days.

Conditioners

Garbage tankage, cocoa shells and other low grade ammoniates are only moving in a fair way, as many manufacturers lack necessary potash to complete their mixing operations and cannot take delivery of some of these materials. A better movement is looked for in about 30 days.

PHILADELPHIA

Season Under Way in South. No Shortage of Chemical Nitrogen or Superphosphate. Potash Shipments Increasing.

PHILADELPHIA, February 27, 1950

The season is well under way in the South, and activity should soon be in evidence in this vicinity. Spot potash is still quite short of the demand, but nitrogen and superphosphate are in ample supply. Blood and tankage are now much stronger.

Sulphate of Ammonia—Demand has increased slightly and supply is quite sufficient for all domestic requirements. The coal strike does not seem to be affecting the overall supply.

Nitrate of Soda—Demand is seasonal with plenty of material to supply inquiries. No price changes are reported.

Blood, Tankage, Bone—The organics market is much stronger and it would seem that some mixers "missed the boat" in not buying while the price was down.

Castor Pomace—Demand for this article is very keen, but there are no offerings in the market.

Fish Scrap—The market is very quiet. Offerings of foreign meal are fairly free at prices under domestic quotations.

Phosphate Rock—Movement is re-

ported as showing satisfactory improvement, and effects of the potash strike are rapidly disappearing.

Superphosphate—Shipments are increasing but there is still room for improvement. Goods are in plentiful supply and no price changes are recorded.

Potash—Shipments are reported coming through in fair volume but the supply is still very short of requirements, and resale material finds ready outlet at premium prices.

CHARLESTON

Adequate Stocks of Chemical Nitrogen and Superphosphate Reported. Organics and Potash Still in Short Supply.

CHARLESTON, February 27, 1950

Organic ammoniates are in heavy demand with supplies tight. Superphosphate is increasing in shipment volume and stocks continue adequate. Potash, in spite of steadily increasing production, continues short of over-all demand.

Organics—Fertilizer organics are extremely tight, with the market bare of low-cost material, except for possibly May shipment. Blood and tankage have increased in the last week 75 cents to $1.00 per unit of ammonia (91 cents to $1.21 per unit N). Domestic nitrogenous tankage is nominally $4.00 to $4.50 per unit of ammonia ($4.86 to $5.47 per unit N), in bulk, f.o.b. production point. Imported organics are at similar levels of price, but arrival dates are too late to interest most fertilizer manufacturers for this season.

Castor Pomace—Demand is active with offerings lacking. Price is nominally $30.50 per ton in bags, f.o.b. Northeastern production points.

Ground Dried Blood—The New York market is around $7.15 to $7.50 per unit of ammonia ($8.69 to $9.12 per unit N), with demand active and offerings limited. Chicago market is around $7.25 to $7.50 per unit of ammonia ($8.82 to $9.12 per unit N), delivered the Chicago area.

Potash—Domestic production is steadily increasing, but shortages throughout the country among the fertilizer manufacturers continue and in some areas are very acute.

Ground Cotton Bur Ash—Producers of this source of carbonate of potash are in heavily sold position. Price is around 65 cents per unit of K_2O in bulk, f.o.b. Texas production point, for material analyzing 30 to 40 per cent K_2O and 3 to 4 per cent chlorine.

Phosphate Rock—The market continues firm with demand steady and movements to acidulators are in good volume.

Superphosphate—As yet movement has not reached full seasonal dimensions, but shipments are increasing. Prices are steady and supplies adequate.

Sulphate of Ammonia—Demand is increasing in seasonal proportions and with the threat of reduced production at the ovens, synthetic material is enjoying a good demand. Prices remain approximately the same, around $45.00 per ton f.o.b. production points in bulk.

Ammonium Nitrate—Suppliers are in well sold position and demand is slightly stronger than supply, particularly for Canadian production. No changes in prices have been noted.

Nitrate of Soda—Demand continues seasonal and prices unchanged. Stocks are adequate.

CHICAGO

Higher Prices for Feeding Materials with Considerable Activity Reported.

CHICAGO, February 26, 1950

The market on ammoniates and feeding materials showed considerable activity this week, with prices advancing materially on most feeding items, but at the close of the week the feeling eased off a trifle Most manufacturers have advanced prices to $105.00 per ton on meat scraps although in some sections prices higher than this are said to have been paid. Digester tankage is quoted on the same basis. Dry rendered tankage is reported to have sold as high as $1.90 per unit of protein delivered at some points, but this price is possibly on the high side today—$1.80 to $1.85 being more nearly the trading level. Wet rendered tankage is up to $8.00 to $8.25 per unit of ammonia ($9.72 to $10.02 per unit N) and dried blood is firm at $7.25 to $7.50 per unit of ammonia ($8.82 to $9.12 per unit N).

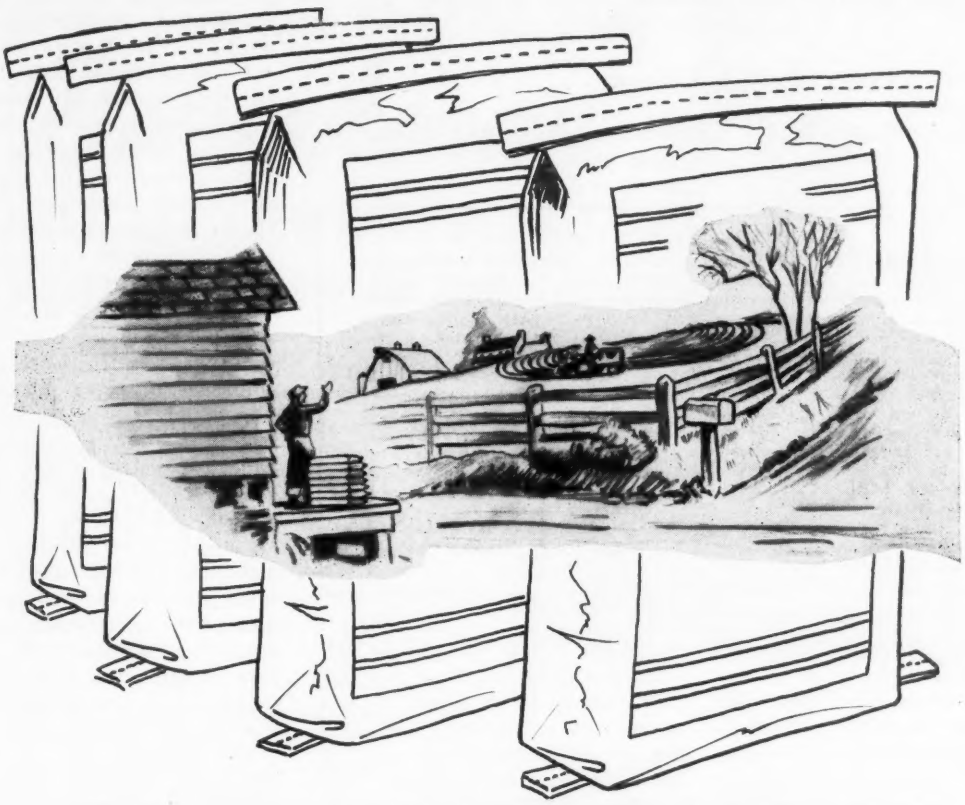
Jaws, skulls and knuckle bones are nominal at $60.00 per ton. Steamed bone meal about unchanged at $70.00 to $80.00 per ton and raw bone meal $65.00 per ton.

NEW BAG IDEA FROM BEMIS BRO. BAG CO.

The paper Band-Label for textile bags—in common use for the past five or six years on cotton feed and flour sacks—has now been successfully adapted to heavy weight burlap bags. Carefully studied test shipments of Band-Label burlap bags have been made by the Quaker Oats Company working in cooperation with the Bemis Bro. Bag Co. and the new bag has found ready acceptance by all who handled it from the feed mill to the feed trough.

Although too early to say definitely it also appears that used bag dealers who reclaim and resell bags for secondary uses will be able to offer a premium price for the Band-Label burlaps because removal of the paper band leaves a more desirable and more valuable unprinted multi-trip bag.

For feed and other manufacturers the Band-Label burlap bag offers another advantage in that their brands are associated only with the original contents of the bag. When a direct-printed bag is re-used the brand of the original user continues in circulation, usually filled with products other than those for which the bag originally was printed. But when a manufacturer puts his brand on a Band-Label the brand stays with the bag only as long as it contains the original product. After the first use the Band-Label is removed and the brand name is not carried on down the line to become associated with a number of other products throughout the life of the bag.



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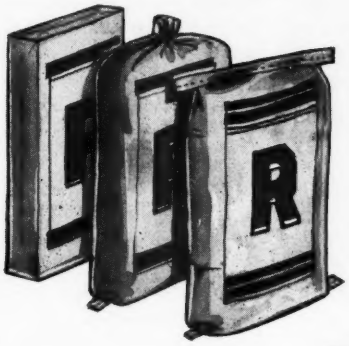
RAYMOND *MULTI-WALL* PAPER SHIPPING SACKS



Each year more and more of our 6,000,000 farmers increase their crops and profits by using good commercial fertilizers. Today, in practically every part of our country, fertilizer is as near to the farmer as his shopping center. Compact, easy-to-handle RAYMOND fertilizer shipping sacks have made this wide distribution possible. These tough, strong, dependable MULTI-WALL PAPER SHIPPING SACKS are CUSTOM BUILT to the special requirements of the producer, packer, and shipper of fertilizer. RAYMOND SHIPPING SACKS are made in various types, sizes, and strengths. They are available printed or plain.

Wire, write or phone RAYMOND for your requirements.

THE RAYMOND BAG COMPANY, Middletown, Ohio

KEEPING AHEAD OF PLANT DISEASES

Task of the Plant Disease Survey and the Forecasting Project

By Paul R. Miller

Senior Plant Pathologist, Bureau of Plant Disease Survey, U.S.D.A., Beltsville, Md.

STARTING WITH THIS ISSUE

AMERICAN FERTILIZER will carry a section on pesticides — a decision brought about through a great many requests for articles on the subject. Many fertilizer manufacturers are now heavily engaged in this phase of farm chemicals. So, to keep pace with a progressive industry, this publication in the future will carry material on the subject.

We are confident that as time goes on, more and more of the members of the fertilizer industry will be turning their thoughts more seriously to adding these chemicals to their line of manufacturing and sales, and those who are already in the field, will expand their activities.

Our first article has been written by a well-known authority, and will appear in a series of three issues. The article will offer a basic understanding of the problems confronting agricultural America, and how it works.

After bringing our readers up to date on this phase, we will follow these series with an article on "What's New In Pesticides" by Dr. Donald E. H. Frear.

THE fertilizer manufacturers and other agricultural leaders in crop-growing regions know that farmers must constantly take measures against plant diseases or run the risk of losing the results of their efforts. In some seasons the loss may be disastrous, but it does not need to be so heavy to be felt as an appreciable factor in the grower's income. Aside from the immediate effect on yield, the energy wasted in planting and caring for the damaged crop and the cost of control measures as well are directly chargeable to the farmer's plant disease account.

Attacks by plant diseases range all the way from slight injury too insignificant to require control or easily controlled by inexpensive routines, to destructive occurrence impossible to control or, what amounts to the same thing, controlled only with such difficulty and expense that the crop can no longer be grown profitably and is eliminated from the region.

The extreme consequence of plant disease is famine. One such catastrophe led to the real beginning of plant pathology as a science, because of the overwhelming need to discover its origin and how to combat it. This was the Irish famine of a century ago, when the previously unknown disease, late blight, attacked without the least warning and completely destroyed several consecutive potato crops, on which the peasant population was almost wholly dependent for food.

When a country is at war, plant diseases can assume a major part in its fortunes. Proof of this statement is the severe epidemic of late blight that was one of the factors responsible for the defeat of Germany in the first World War. The potato crop, which was the mainstay of the war-time diet, suffered such heavy loss in 1917 that morale and resistance of the people were fatally undermined.

These extreme examples of plant disease importance may seem remote now, with our accumulated knowledge about cause and control, the great number and ever-increasing efficiency of control materials, the constantly improving methods for speedy and thorough application and, above all, the continuous watchfulness of farmers, County Agents, plant pathologists and all professional agricultural workers. But they are so only in degree, and it is decidedly worth while to consider what might happen *if* conditions should favor a widespread epidemic in some staple crop, and *if* at the same time control materials, for some reason, should not be easy to obtain. Although it is very unlikely that actual suffering would result, nevertheless both local and national welfare would certainly be affected to some lesser extent. This is not an imaginary situation, even for this country, for we have an actual example in the combination of the potato late blight epidemic in the South and the scarcity of certain kinds of chemicals during the recent war.

Both of these war-time epidemics were natural occurrences, but they emphasize the feasibility of deliberate use of plant diseases as a weapon of biological warfare and biological sabotage. Readers will have noticed the recent deluge of articles and comment on this general subject. In many cases the statements are obviously exaggerated or inaccurate, nevertheless, *under favorable conditions*, purposely introduced or disseminated plant disease infections could damage, slow up, and increase the cost of production, use up scarce chemicals for control, and require greater manpower to produce the same harvest. For many reasons no plant disease could be a sure weapon, but if successful at all, its use could have a decidedly hampering effect, and when conditions were most favorable, results could be as disastrous as from naturally induced epidemics,—or, probably, even more so since growers would be more likely to be taken unawares and since attack would be aimed at particularly vital crops. We can guard against this form of warfare, but we should not ignore the likelihood of its employment or underestimate its potentialities.

Less spectacular but generally more important as ordinary present-day manifestations of the power that plant diseases exert are the rather frequent failures of agricultural industries from continued severe damage. Sometimes only one small locality may be affected, in which a disease may prevent the growing of an otherwise well-adapted and very profitable crop, as the virus disease, aster yellows, recently prevented the establishment of lettuce culture in one West Virginia valley. Other

Here's how this *Customized* Baughman

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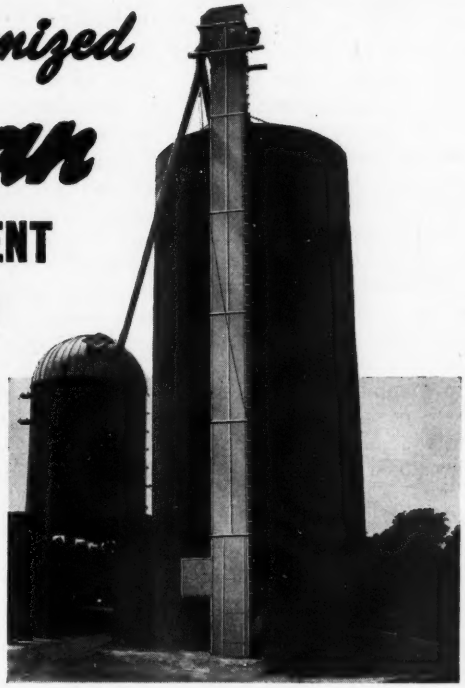
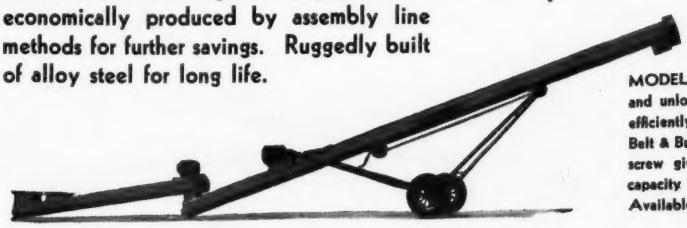


Sell for less—eliminate bagging by handling in bulk and delivering in bulk. It's the most practical, the most efficient way to handle commercial fertilizers.

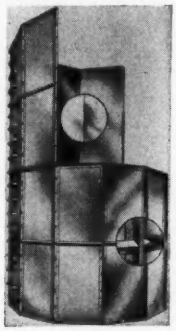
BAUGHMAN Equipment gives you automatic material flow direct from car to storage bin or hopper bin . . . from storage bin to hopper bin for delivery. Cuts man hours to the minimum.

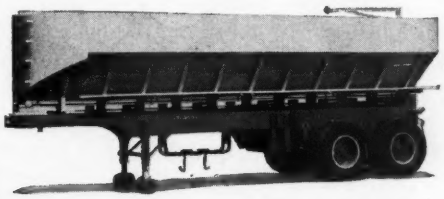
LOW COST. Build your Belt and Bucket Elevator (right) from standard 10′ sections . . . eliminate the expense of a custom-built installation. All Baughman equipment is economically produced by assembly line methods for further savings. Ruggedly built of alloy steel for long life.



MODEL Q SCREW CONVEYOR loads and unloads cars and trucks quickly and efficiently—the perfect teammate for the Belt & Bucket Elevator! Big 9″ conveyor screw gives up to 40 bu. per minute capacity from the horizontal to 50°. Available with or without wheels.

SECTIONAL STEEL SILO (right). Adjustable to meet changing needs! Can be enlarged . . . made smaller, higher or lower . . . or moved anywhere. One section has ladder on both sides. Upper inset shows smooth inside seams . . . lower inset shows easy assembly detail. ANOTHER BAUGHMAN FIRST!





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cases, however, involve the destruction of important permanent industries in whole regions: for instance, curly top, another virus disease, almost destroyed the sugar-beet industry and shut down sugar refineries in Western areas until the development of resistant varieties allowed the general re-establishment of sugar beet growing. Of course, such effects will vary from region to region; they depend on the type of farming, on climate, on the complexity of the problem, sometimes on the speed with which it is recognized that a plant disease is involved. In general, they are more severe where one kind of crop is grown over wide areas, but regions of more diversified farming are not immune.

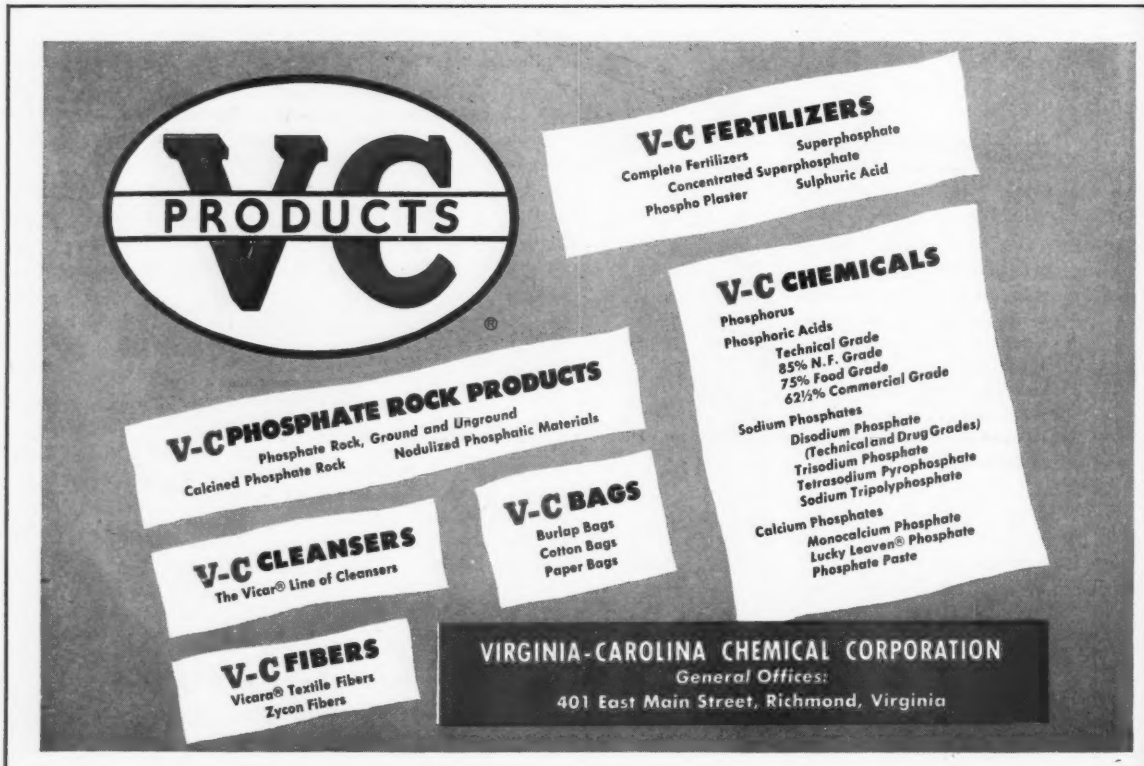
Some fifteen years ago the Plant Disease Survey asked its collaborators for illustrations of failures of crop industries caused by plant diseases. Since that time many changes have occurred. Agricultural industries have shifted from place to place, new disease problems have appeared, and control methods have been developed to take care of some of the earlier problems. Moreover, just now great advances are being made in the development of chemical control materials. All these circumstances together made it desirable to bring this "crop disease hazard" survey up-to-date.

How are the farmers, who after all are the fundamental units in any agricultural industry, affected by such hazards? The consequences are usually described in broad overall terms that give little impression of individual significance. Wishing to obtain such a "grass root" account, we asked, through their State Extension directors, some 425 County Agents throughout the country to report any instances they knew about in which loss from plant diseases had caused a more or less lasting change in a farmer's prospects and work, or in family living standards. Of the 185 replies, about 20 reported definite evidence of hardship resulting from plant disease losses. Seventy-one were negative. Some of the County Agents went to considerable trouble to verify their negative reports; this was an unexpected quality of cooperation and we appreciate it.

Why should the Plant Disease Survey be concerned with such problems? To answer this we might put another question: How do we *know* that plant diseases are important? At first this might seem foolish. One can say that it is easy to *see* that plant diseases generally are among the important enemies of the farmer. Nevertheless, many persons, including various agricultural scientists, have argued that plant diseases are not important in themselves. Some say that "properly adapted" crop plants will not be subject to plant diseases. During the depression years in the '30's many considered plant diseases to be rather a helpful check on production than an injurious and wasteful burden borne by farmers.

Such arguments have the surface plausibility that makes them very persuasive and difficult to counter, even though we know they are not justified. We know that control of plant diseases, by lessening one of the main sources of uncertainty,

(*Continued on page 30*)



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Lion's recently expanded Chemical Division is now ready to supply all your nitrogen requirements!

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LION Nitrogen Fertilizer Solutions

Made specifically for the manufacturing of mixed goods. This product supplies both ammonia nitrogen and nitrate nitrogen in desirable ratios. Easily handled, and available in three types, designed for varying weather conditions and formula requirements, for the production of fertilizers that cure rapidly, store well and drill efficiently.

LION Ammonium Nitrate Fertilizer

In great demand because of its low unit cost (33.5% guaranteed minimum nitrogen) and superior qualities. The improved spherical white pellets are freer flowing and have increased resistance to caking, with better storing qualities.

LION Sulphate of Ammonia

Use of this material enables the manufacturer to produce the high-analysis mixed fertilizers which are increasingly in demand by farmers. In the form of large white crystals which flow freely and resist caking in storage. Shipped in bulk and in 100-pound bags.

Technical advice and assistance to fertilizer manufacturers in solving their manufacturing problems is available for the asking. Just write:

"Serving Southern States"

LION OIL COMPANY
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ROUND UP STORY

Northeastern Experts Report Orchard Fertilizer Tests

AS A ROUNDUP story of recommendations by soil fertility experts in the Northeast, AMERICAN FERTILIZER summarizes below the comments from Connecticut, Maine, Maryland, Massachusetts, New Jersey, and Vermont.

CONNECTICUT—Orchardists must check boron needs by soil testing. Apply borax needed in April every third year. Amount to apply is based on diameter of tree trunk a foot above ground. Up to 2½ inches, none; 3½ inches, 2 ounces; 5 inches, 4 ounces; 7 inches, 6 ounces; 10 inches, 8 ounces; 14 inches, 8 to 12 ounces; more than 14 inches, 12 to 16 ounces.

MAINE—An adequate supply of nutrients and maintain or increase soil organic matter. These conditions can be met in sod orchards of Maine by balanced fertilization and tree mulching. Specifically, these authorities recommend:

A. Maintain a hay or straw mulch under the trees 6 inches deep, or at least deep enough to smother out most weeds and grasses.

B. Each year apply under each tree ⅓ pound of nitrate of soda or its equivalent per year of age of the tree.

C. Annually apply 500 to 700 pounds of 7–7–7 fertilizer between rows.

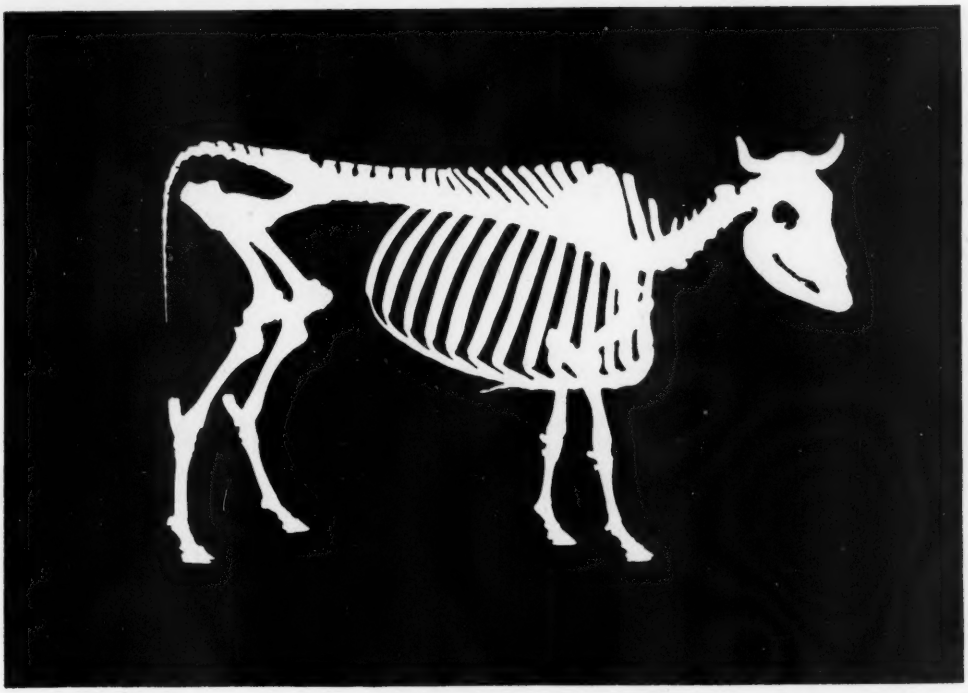
D. Apply magnesium limestone to the orchard floor whenever the need is indicated by soil tests.

E. Watch the trees for hunger signs. (A tree usually is hungry for nitrogen when it has off color or small leaves, or short terminal growth. Shriveling older leaves and yellowing between veins may indicate magnesium deficiency.)

MARYLAND—For cover crops in apple orchards, 1 pound of ladino and 2 pounds of meadow fescue per acre in late April or early May. Lime if needed, and fertilize with 300 to 400 pounds per acre of 0–20–20 disked into the seedbed. In poor, eroded soils use at the same rate of 2–12–12 instead of 0–20–20 the first year.

MASSACHUSETTS—Before using fertilizer to increase production it is necessary to correct extremely acid soils with dolomitic limestone or other neutralizing materials. Neutralizing excessive soil acidity brings about the following: Increased supply of available calcium and magnesium if dolomitic limestone is used; increased availability of phosphates; decrease of essential elements which are toxic if present in too high concentration, such as iron and manganese; decrease of toxic non-essentials, such as aluminum and certain organic toxins; and substitution of beneficial bacteria for those less desirable.

NEW JERSEY—Can grow fruit trees if care is taken to space be-



AMMONIA NITROGEN puts on the MEAT

Ammonia nitrogen, fed to pasture land, puts on the meat, fattens the harvest of T-bones. For dairies it means more well-fed cows per acre, and higher milk production. And better-fed work stock, and hogs. Ammonia nitrogen increases the protein content as well as the yield of grain and grass crops.

High-nitrogen fertilizer applied in the Fall gives the rapid start necessary to building a year-round pasture program.

CSC produces anhydrous ammonia, the most concentrated and economical commercial source of nitrogen, at its Sterlington, Louisiana plant. The major part of this production is going to Gulf Coast manufacturers for conversion into high-nitrogen fertilizers.

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17 East 42nd Street, New York 17, N. Y.

tween trees, fertilize intelligently, prune correctly and spray for insect and disease control. Two pounds of complete fertilizer such as 5–10–5 or 3–12–6 spread over the surface of the soil around the trees, and two feet outward from the base during March and April, will usually be enough for the first season. On poor soils a supplementary application may be needed during early summer.

After the first season apply fertilizer every November or during March or April and increase the amount every season until the tree has reached full-bearing age. Ten-year-old standard size apple trees will require at least ten pounds of fertilizer and peach trees need more than other fruit trees. It may be broadcast or applied 18 inches deep about two feet apart.

VERMONT—Importance is placed on soil acidity in orchards. Application of liming materials, including magnesium and limestone is believed to be of coming importance to area fruit growers. Other important practices are the use of potash, superphosphate, and mulching with air-dried hay, straw, shavings or sawdust. Proper use of these materials can improve the soil condition, eventual tree growth and the fruit crop at a reasonable cost.

NEW BOOKLET

Agronomist J. K. Plummer of the Tennessee Corporation, 61 Broadway, New York City, has just published an 18-page booklet, *The Role of Rarer Chemical Elements as Nutrients to Plants, Animals, and Man.* If you are interested why not write today for a copy?

SUPERPHOSPHATE IN 1949 SLIGHTLY BELOW 1948 FIGURES

Totaling approximately 10.5 million equivalent short tons of 18 per cent product, the 1949 output of superphosphate was a fraction of 7 per cent below that of 1948, according to reports received by The National Fertilizer Association and a summary of reports received by the Bureau of the Census. Comprising the 1949 total were 9,078,000 short tons of normal (18 per cent A.P.A.) superphosphate, 60,400 tons of 18 per cent wet base goods and 549,000 tons of concentrated (45 per cent A.P.A.) super. The over-all figure covers production at 185 acidulating plants which account for practically all superphosphate manufacture in the United States.

The 1949 turnout of concentrated product was the highest on record, exceeding the 1948 figure by approximately 17 per cent. Production of normal and wet base goods, on the other hand, represented declines of 2.5 and 1.8 per cent respectively from corresponding 1948 figures.

The determining factor in the 1949 shortage would seem to be the effects of the potash strike during November and December. As mixing operations were held up for lack of potash, supplies of superphosphate accumulated at both mixing and acidulating plants, with the result that many producers were forced to curtail operations.

The total equivalent tonnage produced during December, although higher than that of the same month a year earlier, was about 4 per cent below the 1949 average monthly production of 876,000 short tons. As compared with the November total, the December figure of 840,000 tons was down about 1.2 per cent. The month's output was above average in the case of concentrated superphosphate, average for wet base goods, and below average for the normal form.

TOTAL PRODUCTION
Basis 18% A.P.A.

	1949	1948
Stocks, first of period	1,407,693	1,039,952
Production	10,511,577	10,552,971
Received from other acidulators	96,573	126,006
Book adjustments	44,949	41,422
Total supply	12,060,792	11,760,351
Shipments	6,122,179	5,953,979
Used in reporting plants	4,518,269	4,398,679
Total disposed of	10,640,448	10,352,658
Stocks, end of period	1,420,344	1,407,693

DECEMBER FIGURES

Normal, 18% A.P.A.	1949	1948
Production	714,972	727,149
Total disposition	629,825	681,574
Stocks, at end of month	1,137,072	1,216,788
Concentrated, 45% A.P.A.		
Production	47,981	35,914
Total disposition	45,744	41,814
Stocks, at end of month	105,007	70,681
Base Goods, 18% A.P.A.		
Production	4,953	5,583
Total disposition	764	4,074
Stocks, at end of month	20,755	14,206

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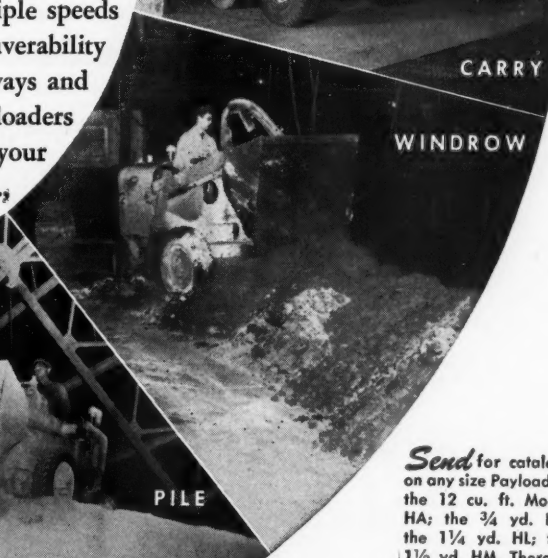

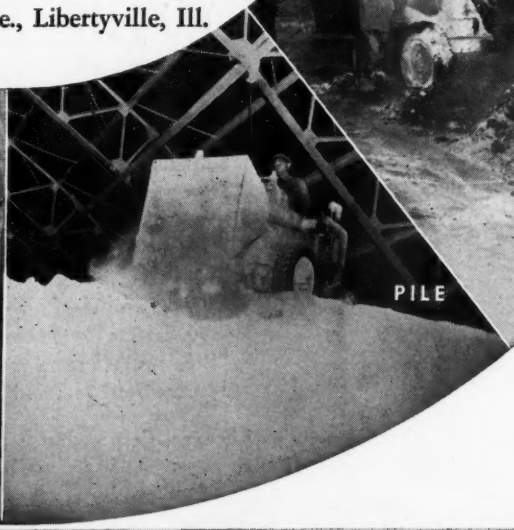

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Standard Symbol Approved for Bags

In a move to stimulate the salvage value of used multiwall paper bags, members of the Paper Shipping Sack Manufacturers' Association have approved a program for marking with a standard symbol all multiwall bags made of natural kraft paper which are suitable for repulping.

Four groups have a vital interest in the plan, namely (1) pulp consumers, (2) waste material dealers, (3) bag emptiers, (4) bag manufacturers.

A clearly imprinted emblem on bags which may be used for repulping purposes, it is felt by the bag manufacturers, will create a more confident approach by the waste dealers and pulp consumers to the utilization of such bags. This should provide steadier market for the bag emptiers and in turn enhance the competitive position of the multiwall bag in relation to other containers.

While the plan has been approved by members of the PSSMA, the matter of imprinting the symbol "ANK" (all natural kraft) will be entirely at the option of the bag manufacturer or his customers.

It should be noted that while the plan has now been approved, it may be some months before the waste dealers and the consumers of the used bags for repulping will find the bags marked in substantial volume. Present inventories will, of course, be appearing for some time unmarked.

It has been agreed that the "ANK" symbol is to be printed on the backs of bags made of all natural kraft paper, just above or below the Consolidated Freight Classification certificate. The PSSMA notice to the multiwall bag manufacturers points out that the symbol must not appear on multiwall bags constructed with any plies of wet-strength asphalt laminated impregnated polyethylene or wax-treated papers.

DOW AMMONIA PLANT AT FREEPORT, TEXAS

The Dow Chemical Company has started construction on a new $5,000,000 ammonia plant at Freeport, Tex.

The company states that it expects the plant to be completed and in production by late 1950. It will make available refrigeration grade and technical grade anhydrous ammonia in tank car quantities as well as quantities of aqua ammonia to industrial and agricultural consumers in the South and the Mississippi Valley.

WERTHAN BUYS BOSWORTH BAG

Another consolidation of companies takes place with the news that Werthan Bag Corporation, with general offices in Nashville, Tennessee, has announced the purchase of M. M. Bosworth Company of Memphis, Tennessee. Millard M. Bosworth of the Bosworth Company will be associated with Werthan Bag Corporation.

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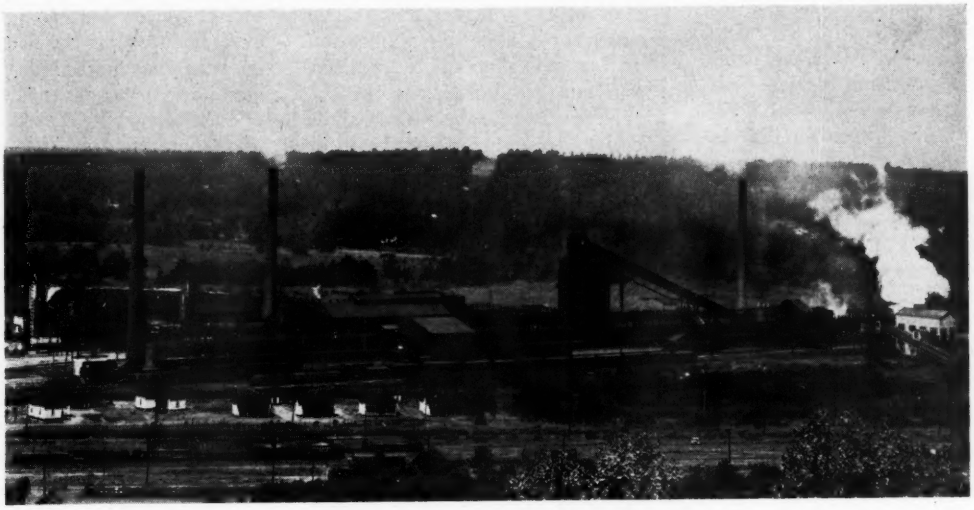

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LACK OF PLANT FOOD AFFECTS PECAN YIELD

Arkansas pecan growers, worried because much of the 1949 crop of nuts didn't fill out properly, were advised by Earl J. Allen, horticulturist of the Extension Service, University of Arkansas College of Agriculture, to build up soil fertility in their orchards.

"In practically all instances where nuts were poorly filled out," Allen stated, "there was no evidence that the trouble was caused by either insects or disease. Rather, there was every indication that the cause was lack of plant foods in pecan grove soils."

If pecans are to continue to be better than a half-million dollar crop in Arkansas, orchards must be treated like any other cultivated crop, the horticulturist stressed. An important practice is to clean cultivate the grove during the summer months. This gets rid of weed and grass competition for plant foods and moisture.

In one test a grove that was clean cultivated in the summer and planted to a winter legume during the winter, yield was 886 pounds of pecans per acre. When grown with a cotton intercrop, harvest dropped to 425 pounds. Grown in a sod, the trees yielded only 145 pounds.

Diseases and insects seldom will be a problem if the pecan growers use good sanitary measures, the horticulturist pointed out. Old shucks, leaves and twigs—the major sources of infection — should be turned under before leaves begin to form. Ground should then be left undisturbed until early June, when summer cultivation starts.

Winter cover crops for orchard groves are strongly recommended. If mature, bearing trees are 25 years or more old, they should receive 600 to 800 pounds of 5-10-5 fertilizer per acre in the fall, under the cover crop. In the spring, each tree should receive ten to 20 pounds of nitrate of soda or its equivalent.

For each younger tree, Allen recommended a spring application of two pounds of complete fertilizer, plus a half-pound of nitrate of soda, for each year of its age. To be most effective, spring nitrogen fertilization should be done four to six weeks ahead of blooming.

SCOTTISH REPORT ON PLANT FOOD USE

Some very interesting results are published in the report of the Scottish Standing Committee in the December 14th issue of *The Fertiliser Journal* from London.

The report is the result of work done by the group appointed in January, 1949, for the purpose of calculating annually the values to be given to chemical nitrogen materials and feeding stuffs.

The most interesting section of the report to AMERICAN FERTILIZER readers is found in the tables on plant food residues.

In an experiment running through three seasons the committee reported that nitrogen was used up after the first season. In organic manures, other than dried blood and dried poultry manure the rate of use was one-half the first season, one-quarter more the second season, with the residues completely gone the third growing season.

In phosphoric acid the rate at which the plant foods were exhausted was one-half the first season, one-quarter more the second season, with only one-eighth left the third season.

In potash the rate was swifter, with one-half used the first season, one-quarter more the second, and the potash all gone the third season.

The evidence according to this report seems to indicate that there is no significant difference between the rate of exhaustion of the various phosphatic fertilizers, and no clear evidence to justify a difference between phosphate applied to arable land and phosphate applied to grassland.

HERE'S WHAT CAN BE DONE BY FERTILIZING

"If every dairy farmer in Massachusetts used fertilizer to grow feed on the same basis as the contestants in the Massachusetts Green Pastures Program, as much tonnage of fertilizer would be distributed on dairy farms as the entire total now used in the state for all agricultural purposes," according to Ralph Donaldson, Extension Agronomist.

The 30 farmers with high pasture scores spent an average of $19.00 per cow for fertilizer. On an acre basis the average application of plant food amounted to 12.4 pounds of nitrogen (N), 44.6 pounds of phosphorus (P_2O_5), an 32 pounds of potash (K_2O) at a cost of about $8.25 per acre. This fertilizer application, however, is not high compared to tested higher rates which have given maximum pasture yields.

FERTILIZER AND LIME AIDS KENTUCKY ALFALFA

Nearly all well-drained land in Estill county Kentucky is naturally suited to alfalfa, notes Farm Agent Fred Brockman. He cites the case of Ernest Walton, who reported a yield of more than a ton of hay per acre per cutting for four cuttings on a stand of alfalfa 12 years old. The plot was sidedressed every two or three years with 500 pounds of commercial fertilizer and a ton of lime to the acre.

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RADIOACTIVE FERTILIZER
Tests Now Started in Virginia Station

Down in Virginia the agronomists are already underway with work on radioactive fertilizers at the Experiment Station, according to Dr. S. S. Obenshain.

Since being approved by the Atomic Energy Commission in January, plans have been "stepped up" and "atomic fertilizer" is now being applied to plots.

This fertilizer will be applied to alfalfa plots in a study aimed at charting the course of phosphorus, and finding out when and how much of the phosphorus is actually used by the crop.

Dr. Obenshain explains that only 5 to 20 per cent of phosphorus available in the soil, or applied as commercial fertilizer, is used by any crop.

If the researchers, by the use of radioactive fertilizers, can find a way of upping the availability of phosphorus, it will mean an annual saving of several million dollars. Virginia farmers spend about $10,000,000 each year for phosphorus.

The radioactive fertilizer, which gives off identifiable radioactive rays, can be "traced" in the plant, much as marked money can be traced.

Two more larger shipments of radioactive materials are expected in April. They come from the Oak Ridge Institute of Nuclear Studies through the Bureau of Plant Industry in Washington.

Other studies with radioactive fertilizers planned at V.P.I. aim to:

Find out if the ammoniation process commonly used in manufacturing mixed fertilizers decreases the availability of phosphate. The test crop here will be corn.

Find out how liming, and the depth of phosphate placement in the soil, affects the rate and speed of the downward growth of alfalfa roots.

Compare the availabilities of water soluble phosphate fertilizers with conventional citrate soluble phosphate fertilizers. The test crop will be sudan grass.

Dr. Obenshain explains that no one experiment can last over six months, because of the brief "half-life"—only 14.3 days—of the radioactive fertilizers. An experiment, atomic scientists compute, can last about ten times as long as the half-life of the material.

Members of the Atomic Research Committee at V.P.I. are: Dr. C. C. French, vice-president of the college, and committee chairman; J. F. Ryman, H. V. White, and Obenshain.

"94 YEARS" OF TESTING BY MISSOURI'S SMITH

No farmer or fertilizer manufacturer has time to wait 94 years to judge the results of various crop rotations, and so the results obtained by Missouri's soil expert, N. C. Smith, make very interesting reading.

According to Smith, the addition of 150 pounds of 0–20–0 fertilizer on wheat experimental plots at the Missouri Experiment Station has increased the yield 6.5 bushels over the non-fertilized wheat, and in his tests he used enough different rotations to equal 94 years of regular farming.

When potash was added to the above phosphate fertilizer the yield was increased another bushel and a half on the average, or eight bushels over the non-fertilized wheat.

It was found that the influence of the fertilizer varied with the different crop rotations. The 150 pounds of 0–20–0 gave an increase of eight bushels of wheat in a rotation of corn, oats and lespedeza, wheat and lespedeza, and lespedeza. This was double the four-bushel increase in the rotation of corn, wheat and red clover.

When potash was added in 0–20–10 fertilizer, the yield of wheat in the corn, wheat, red clover rotation was increased three bushels per acre while in the corn, oats, wheat, sweet clover rotation the wheat yield was only one bushel more. This shows that the value of potash or potassium is greatly influenced by the crops in the rotation and the removal of a legume for hay.

In a comparison of plowing and discing for wheat on the unfertilized plots of continuous wheat and lespedeza the plowing boosted the yield of the wheat 6.2 bushels. Plowing also increased the yields about five bushels per acre on the fertilizer plots. In general, the wheat yields on the wheat and lespedeza rotation were much lower than the wheat yields in the longer rotations such as corn, wheat and red clover or corn, oats, wheat and sweet clover.

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MISSOURI SAYS ROW CROPS SATISFACTORY

Recent experiments at the Soil Conservation Experiment Farm near McCredie, Mo., show that row crops, such as corn and soybeans, can be grown with comparative safety on soil well fertilized and conditioned by grasses and legumes

At the Experiment Farm corn and soybeans both gave good yields without serious loss of soil by erosion in 1949. In fact the loss of soil was lower in only one other year in the nine years the experiment has been in operation. And the low marks in erosion both occurred in the last three years during which adequate fertilizer treatments have been applied.

Erosion control by cropping is secured only after the soil fertility has been raised to levels at which lush crops of grass and legumes can be grown, comments D. D. Smith, who has been in charge of these experiments.

The soil treatments for the corn included liming, 1,000 pounds of rock phosphate, 300 pounds of ammonium nitrate, and a like amount of starter fertilizer of 5–10–10 formula. The costs figured on an annual prorated basis so far were $22.00 per acre, but returned from 62 to 86 bushels increase of corn.

This tells readers of AMERICAN FERTILIZER that it is incorrect to say that the crop is the cause of the erosion, except as the crop takes out the fertility, as cultivation of the crop decays the humus more speedily, and as less fertile soil fails to hold structure under the beating of the rain and high runoff with erosion occurs. Building the soils back in fertility means reduction in erosion. At the same time it gives bigger and better feed crops to pay for the farming and fertilizer costs with a big margin of profit from the practice that does not give a bad name to any crop.

SPRAY APPLICATION OF NITROGEN FOR ORCHARDS

Six years of tests at the New York State Agricultural Experiment Station have determined that spraying apple foliage with urea, a soluble form of nitrogen, not only maintained yields as well as did soil applications of nitrogenous fertilizers but also reduced the amount of scab in the orchard.

"Growers interested in producing quality McIntosh often fail to notice the relationship between green fruit color and susceptibility to scab," says Dr. D. H. Palmiter in commenting on the Station tests in the Hudson Valley. "Experiments have shown that a tree overfertilized with nitrogen to the point where it produces green apples is much more susceptible to scab on both leaves and fruit than an unfertilized tree."

Ordinary nitrogen fertilizers are too toxic to spray on McIntosh trees, but urea-type materials have shown promise. Three, five, and eight pounds of urea in 100 gallons of spray which also contained wettable sulphur and lead asrenate were compared with equivalent soil applications of nitrogen. The urea was used in the first three sprays following bloom. Two sets of unfertilized trees were included in the test, one set sprayed with sulphur and one with Fermate.

"The better scab control on the urea-sprayed trees may have been due partly to a better nitrogen balance in the trees," says Doctor Palmiter. "But the results also indicate a direct increase in fungicidal effectiveness when urea was used with the sulphur and arsenate of lead. The urea-sprayed trees showed better fruit color and less pre-harvest drop than where the fertilizer was applied to the soil."

It has been found that apple leaves take up urea at once and begin using it within a few hours, whereas nitrogen applied to the soil may require a matter of several weeks to reach the leaves, depending upon weather conditions.

COKE OVEN DIRECTOR GIVES 10-10-10 TIP

In his easy informal way H. H. Tucker, director of the Coke Oven Ammonia Research Bureau, Columbus, Ohio, told the New Jersey Field Crop Improvement Cooperative Association recently that, "One step toward high-yield, low-cost production can be obtained if every dairy farmer purchases one pound of 10–10–10 fertilizer for every ten pounds of milk he expects to produce, and applies his fertilizer in a well-planned and well-managed program to give greatest returns."

Speaking on "Fertilizer—A Tool in Low Cost Production" Tucker stressed management and returns in his address during New Jersey's 78th Annual Farmers Week.

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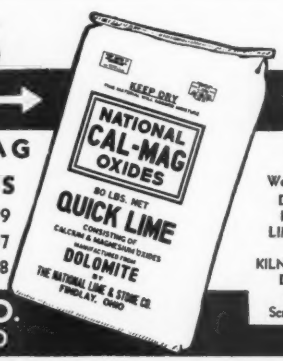

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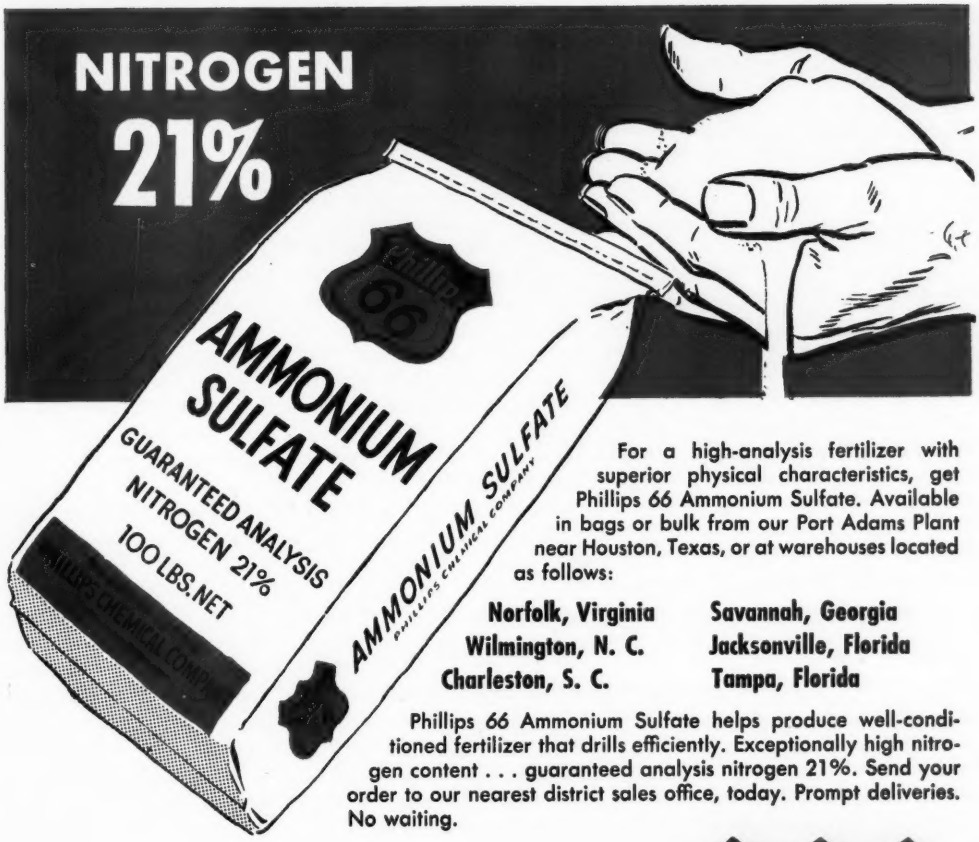

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Keeping Ahead of Plant Diseases

(*Continued from page 14*)

wasted energy and confusion, takes its place along with all the other improvements — mechanical, cultural, chemical, and biological—to increase agricultural efficiency and stability. Since many of the most troublesome disease-producing organisms are favored by the same conditions as their hosts, "proper adaptation" is scarcely a cure-all.

Nevertheless, such notions at times react unfavorably on the study of plant diseases. For the sake of plant pathology as a science, as well as of the farmers who need its help and finally put its findings into practice, it is essential to show up their inherent fallacy or only partial truth.

But we cannot do this by just saying that plant diseases are important. When we stop to think, it is obvious that mostly we rather take their importance for granted. We can see the damage that a disease causes here and now, and we feel that that is evidence enough, but, all too frequently, no record is made and as time goes by what happens now will become blurred and faint in recollection. It will no longer be a fact in evidence. As memories of loss accumulate they pile up into a mental background of impression that plant diseases are important, but impressions are individual and are not evidence, however strong they may be.

For convincing objective evidence of plant disease importance, that will give other persons a basis for understanding what we are talking about when we say that a disease is important, we need to record our observations so that at some future time we can show that it was actually the disease and not some other circumstance that caused the trouble, to describe accompanying conditions so that we can correlate variable factors with prevalence and loss, and to appraise and express the damage in some manner so that we can compare importance of one disease with another or of the same disease at differenct times or in different regions. For many purposes such comparisons are not necessary, but for many others they help a lot in pointing to the essential relations in a mass of otherwise clueless data.

Importance is the result of all the complicated environmental and biological factors that affect plant disease attack and development. It is not easy to determine the degree of importance or to find a satisfactory means of expressing it. This is one task of the Plant Disease Survey. How this task fits into the Survey objective, and how the Survey fits into other plant pathological investigation, constitute the subject of these articles.

Investigation of Problems Connected with Plant Disease

The problems connected with plant disease occurrence may be stated briefly in broad general questions, such as: What causes the disease? How does it attack and develop in the plant? How does it spread from one plant, field, or region to another? What are the conditions or agencies that help or hinder development and spread? How is it carried over from one crop season to another? Where did it come from and how did it get here (in the case of a newly discovered disease)? Where else is it found? How much damage does it cause? Can it be prevented or controlled effectively and at the same time economically? (It will be seen that the questions are phrased with reference to parasitic diseases, but the modifications necessary to fit non-parasitic troubles are obvious.)

For a really satisfactory understanding of plant disease activity, both controlled experimental studies and careful field observations are needed. In general, cause, control, and determination of specific factors and processes in infection and development are primarily experimental problems, whereas knowledge of geographical distribution, importance, and spread is mostly obtained from direct observation. Of course there is no hard and fast line; on the contrary, there is a very close interdependence and each type of investigation is aided by the findings of the other. For instance, analysis of recorded observations on the circumstances accompanying the presence or absence of a certain disease in different areas or at different times may reveal a good starting point for experimental study to determine the relative importance and specific range of influence of the separate environmental conditions in the development of this disease. On the other hand, what is known experimentally about environmental conditions favoring attack by a disease-producing organism may indicate the probable rate of spread and the final limits of distribution, as well as whether the disease is likely to become a menace in a given location under ordinary circumstances.

The term "research" has commonly been employed in a limited sense, to mean only experimental investigation. Along with this restricted conception there has usually been the idea that field observation or "survey" has only a minor function, if indeed it be not superfluous. Such a narrow understanding of research has often kept plant pathologists from making the most effective use or recognizing all the implications of experimental studies. The fact is that experiment and observation are both research tools, and both must be used to obtain results capable of any but the narrowest application, each to check, verify, and direct the other.

Field observations as units have a limited usefulness in themselves, but when they can be studied in connection with each other and with relevant information from other sources they become really significant. For this there must be some system of bringing them together and putting them on record permanently. The purpose of the Plant Disease Survey is to collect such information from all sources, on the history of plant diseases, and on plant disease occurrence, distribution, imporance, and spread, together with the factors involved and their interrelations, and to make this information accessible.

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PHOSPHATE BIDS REPORTED

The United States Department of the Interior in a letter to AMERICAN FERTILIZER expressed appreciation for the story in the December 24th issue on phosphate leases by the Bureau of Land Management.

The Department reported that a Dallas, Tex., firm bid on three of the ten units offered, as follows:

Unit 8—$2.10 per acre, total of 1,160 acres.

Unit 9—$2.10 per acre, total of 1,488.15 acres.

Unit 10—$2.10 per acre, total of 1,488 acres.

The business address of the firm is: Winfrey, Stuart, Andrade and Hughes, 1321 National City Bldg., Dallas.

NEW V-C DIRECTOR

William Munford Tuck, former governor of Virginia, has been elected a director of the Virginia-Carolina Chemical Corporation, Richmond, Va., it has been announced.

Impressions of America

(*Continued from page 7*)

fertility in Britain by regular rotation of crops than was apparently until recently the practice in American agriculture.

In the factory we have found a wide variation in the standard of working conditions and of machinery guarding. On the average, it appears that the British industry pays greater attention to these matters, although consciousness of the value of good working conditions and good safety practice seem to be growing in the American industry.

To conclude, we wish to place on record our gratitude for this wonderful experience. Even if we returned to Britain without having learned anything new about the fertilizer industry—which is impossible, because we all have something to learn from each other—our contacts with the American people have confirmed the impression that the Americans are our real friends and are anxious to do all they can do to help us in Great Britain on our road to recovery, in which the fertilizer industry plays so important a part.

Mineral Elements and Nitrogen in Manure vs. Manure

(*Continued from page 6*)

the same spot. The results for 1948 are given in Table 3. On the Evesboro sand 1/50th-acre plats replicated five times were planted with the Rutgers variety of tomatoes. The manure was applied previous to cultivation and the mineral and nitrogen salts equivalent to the manure were applied as a side-dressing while the plants were growing. It is obvious from the data shown in Table 3 that the manure was superior in yield and quality to no manure, but it is further observed that the mineral elements and nitrogen applied as a side-dressing were superior to manure. Twenty-five pound composite samples of tomatoes were taken at two different periods during the harvest season for analysis and the mean of the results is given in Table 3. In other words, in order to offset the difference in date of maturity, the two sets of samples were taken.

The 1949 crop grown on the identical plats shows the same characteristics. From these data therefore it can be safely said that if the mineral elements and nitrogen are supplied to the plant at the proper stages of growth, an equivalent growth and quality of the crop can be obtained as compared with that from the average use of manure. It is therefore the opinion of the author that through the proper use of mineral elements and nitrogen to attain the optimum nutritional balance for the crop concerned, maximum yields and quality may be obtained.

Due credit is given C. E. Smith, R. L. Isaacs, Jr., and F. A. Shelton for assistance in this work.

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TABLE 3

THE INFLUENCE OF MANURE AND CHEMICAL ELEMENTS IN MANURE UPON QUALITY OF TOMATOES UNDER FIELD CONDITIONS

				Grams per Liter			*m.e. per Liter*					*ppm*		
Treatment	*Relative Yield*	*Color* (4)	*pH*	*Total Solids*	*Ash*	*Sugar*	*Titrable Acids*	*N*	*P*	*Ca*	*Mg*	*Ascorbic Acid*	*Mn*	*Fe*
No Manure (1)	55	C	4.55	58.7	4.55	30.5	58	124	12	3.0	1.9	229	0.3	4
Manure (2)	70	C	4.55	57.1	4.32	30.0	59	119	13	2.9	1.9	221	0.5	5
Mineral Elements and Nitrogen (3)	100	B	4.55	61.0	4.98	34.7	64	135	14	2.9	2.0	219	0.5	5

(1) 1000 lbs. 5–10–10 per acre broadcast on all.
(2) 4000 lbs. dry cattle manure per acre equivalent to 10 tons wet.
(3) Elements in manure as soluble salts.
4) Relative color—mean of two sampling dates, one early and one late.

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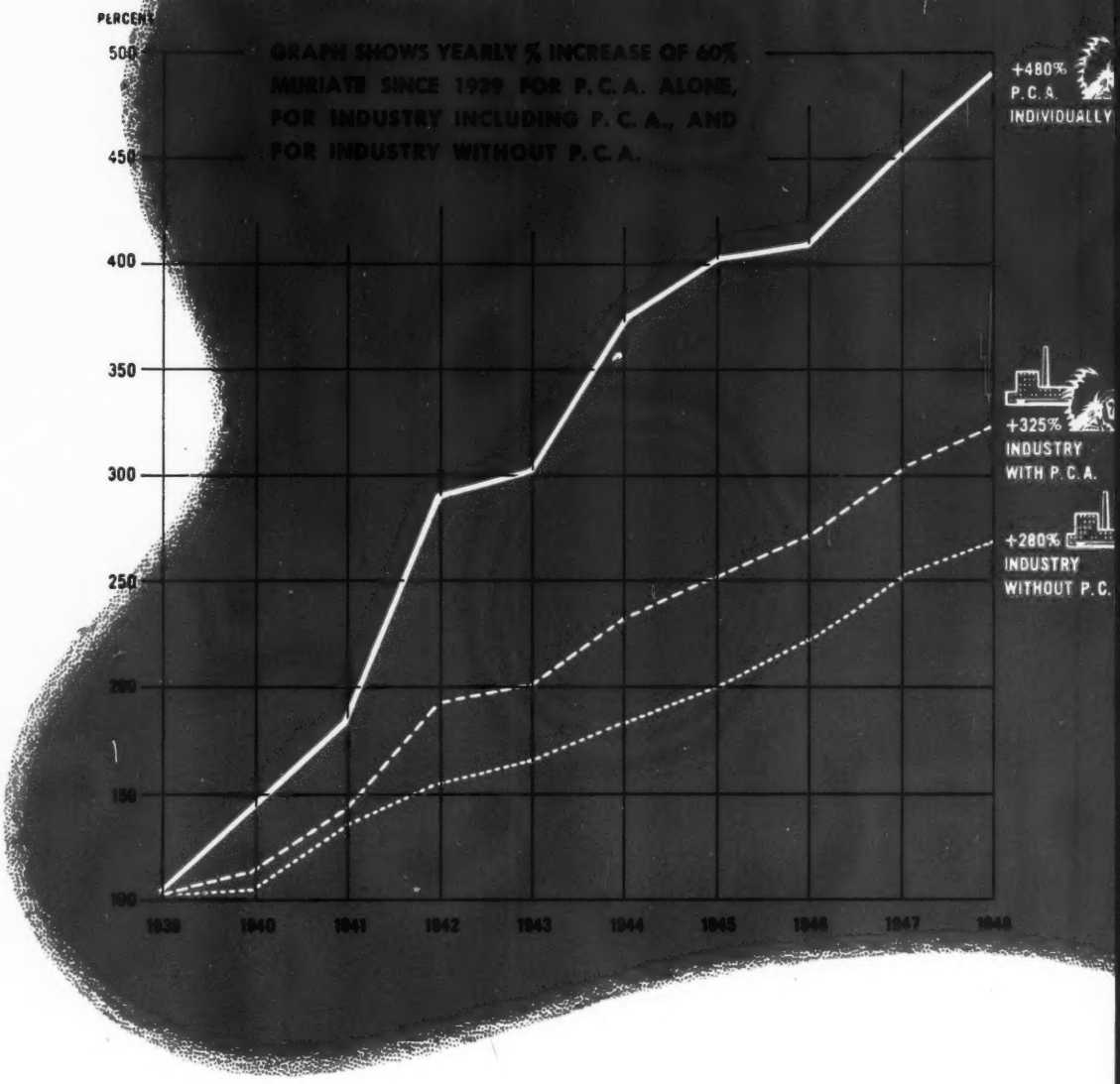

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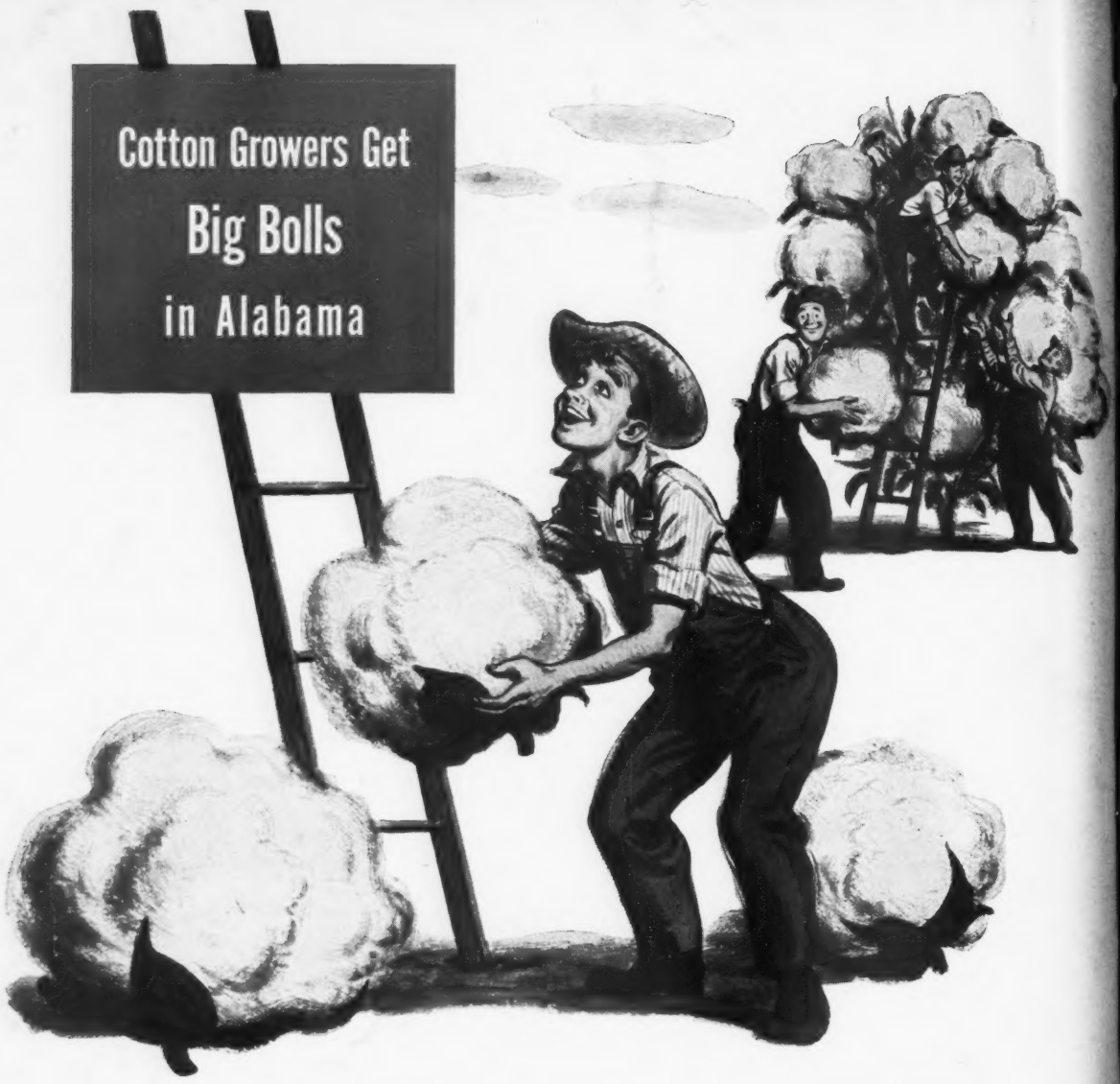

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